

## REMARKS

Claims 1-25 are currently pending in the application. By this amendment, claims 1, 7, 13 and 19 are amended. The foregoing separate sheets marked as "Listing of Claims" shows all the claims in the application, with an indication of the current status of each.

### Claim Rejections

#### 35 USC § 102(b)

Claims 1-3, 5-9, 11-15, 17-22, 24 and 25 stand rejected under 35 USC § 102(b) as anticipated by Kim, (US 4,528,474, hereafter "Kim"). This rejection is traversed.

The present invention provides a thermionic cathode that includes a crystalline emitter having a tip and a cone. The outer surface of the cone has a coating of carbon. The carbon coating on the cone causes a decrease in emissions from the conical surface; emissions are largely confined to the tip of the emitter, which is not coated. This results in increased angular intensity and brightness, and significantly prolongs the useful life span of the cathode. This also makes it possible to utilize crystalline emitters with sharper cone angles.

Significantly, in the cathode of the invention, the sides of the crystalline emitter are also not coated. This is illustrated, for example, in Figure 5A, which shows that carbon coating 12 is located on the conical surface 13 of the emitter. The sides of the emitter (numeral 15, described as a "lower cylindrical or rectangular portion" on page 6 at lines 3-4) are not coated with carbon. Further, the advantages of this coating strategy (coating only the conical surface but not the sides) are described in the specification on page 6 in the sentence beginning at line 24, which states: "The sides of the crystal 15 in general should not be carbon coated, as this might lead to increased surface emissivity and greater heat loss by infra-red (IR) radiation, requiring greater heating power."

In order to clarify this feature of the invention, claims 1, 7, 13 and 19 of the application have hereby been amended to recite that the emitter includes sides, where the cone is located between the tip and the sides, and that the sides of the crystalline emitter are not carbon coated (claims 1, 7 and 13) and that the carbon coating is not applied to the sides of the crystalline emitter (claim 19). Support for this amendment is found in the specification, for example, on page 6 at line 24, as noted above; and in Figure 5A and the description of Figure 5A on page 6 at

lines 3-4, also as noted above. The sides may be cylindrical, rectangular, or any other suitable configuration, so long as the emitter includes a tip, a cone, and sides located on the opposite side of the cone from the tip.

In contrast, Kim teaches a cathode in which the crystal is coated on both the conical surface and the sides of the crystal. This is stated, for example, in the abstract, which states that “the cathode comprises a thermoelectron emissive material having a low work function and one or more thin layers which cover the side surface of the cathode.”; and in column 3 at lines 17-18, which state that “The side surface of the cathode is coated with one or more thin layers...”. This feature is also recited in claim 1, (see column 12, lines 39-40) which states “...a thin coated layer which covers the side surface of said shaped thermoelectron emissive material...”. Similar language is used in claim 2. Applicant notes that Kim does not appear to provide a definition of “side surface. However, the meaning is clearly illustrated, for example, in Figures 2, 3, 4 and 9, where the coating is consistently depicted as encompassing both the conical surface and the vertical sides of the crystal. For example, Figure 2 is discussed in column 6, at lines 26-36, where the coating 56 is referred to as the “thin layer 56”. As can be seen in Figures 2, 3 and 4, the thin layer 56 extends from the tip 29, over the conical surface, and along the vertical sides of the crystalline emitter. Another variation of the invention of Kim is shown in Figure 9. Figure 9 is discussed in column 10, at lines 63-65, which states that “Now, referring to Fig. 9, a cathode structure 65 consists of two thin layers 66, 67 of different coating materials on a thermoelectron emissive material.” In this second embodiment, two “thin layers” are present, but again both layers are depicted as extending from the tip 29 along the conical surface of the emitter and along the vertical sides of the emitter. Because Kim coats both the tip and the sides of the emitter, the cathode will not work properly (e.g. due to increased surface emissivity and greater heat loss by IR radiation). Also, the proposed carbon coating by Kim, applied to cone and sides, would likely short out the cathode heating circuit.

Applicant submits that Kim does not at any point show or suggest limiting the coating to the conical surface of the crystal. Rather, Kim consistently describes embodiments in which the sides of the crystalline emitter are also coated. Applicant submits that it is the present invention

which takes into account the disadvantages of applying a coating to the sides of the emitter, and which provides the inventive concept of applying the coating only to the conical surface.

In view of the foregoing, Applicant respectfully requests reconsideration and withdrawal of this rejection.

**35 USC § 103(a)**

Claims 4, 10, 16 and 23 stand rejected under 35 USC § 103(a) as unpatentable over Kim (as above). This rejection is traversed.

The inappropriateness of Kim as prior art, and the marked distinctions between Kim and the present invention, are discussed in detail above in the section dealing with the 35 USC § 102(b) rejection. In that section, Applicant has shown that Kim does not anticipate the present invention as claimed herein, and neither shows, suggests or discusses at any point the present invention, i.e. limiting the coating of the crystalline emitter to only the conical surface of the crystal, and not coating the sides of the crystal. Therefore, no combination of Kim with knowledge in the art (e.g. types of carbon coatings) renders the subject matter of the present invention obvious.

In view of the foregoing, Applicant respectfully requests reconsideration and withdrawal of this rejection.

**Conclusion**

In view of the foregoing, it is requested that the application be reconsidered, that claims 1-25 be allowed, and that the application be passed to issue.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at 703-787-9400 (fax: 703-787-7557; email: [ruth@wcc-ip.com](mailto:ruth@wcc-ip.com)) to discuss any other changes deemed necessary in a telephonic or personal interview.

If an extension of time is required for this response to be considered as being timely filed, a conditional petition is hereby made for such extension of time. Please charge any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 50-2041.

Respectfully submitted,



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